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NORTHERN

Utilization Research & Development Division

Publications and Patents

January - June 1965

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United States Department of Agriculture**

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Northern Utilization Research and Development Division
Agricultural Research Service
United States Department of Agriculture
1815 North University
Peoria, Illinois 61604

Issued July 1965

INTRODUCTION

The Congress in 1938 authorized four regional laboratories, now known as Utilization Research and Development Divisions, to conduct basic and applied research designed to expand, improve, and develop through science and technology the utilization of American farm crops. The need and importance of such research arise because the farmer is not organized to carry on modern scientific research to maintain old markets for his products and to create new ones. Since their inauguration, these laboratories have contributed much basic knowledge of the chemical composition and physical properties of farm commodities and have applied this knowledge to create new or improved products and processing technology that have enhanced utilization of many farm commodities.

The Northern Division is responsible for research on industrial utilization of the cereal grains—corn, wheat, barley, grain sorghum, and oats; and the oilseeds—soybeans and flaxseed. Except for

wheat and barley, the research includes food and feed uses of these crops. In the Department's program of research on replacement crops, the Northern Division conducts all screening and characterization studies on uncultivated plants and their components. It is also responsible for more intensive research on new oilseeds containing erucic acid and on new gum and pulp fiber plants. In addition to its internal program of research, it carries out work through domestic contracts and grants and conducts related research abroad under grants or contracts involving Public Law 480 funds.

The research investigations at the Northern Division are supported by more than 400 people, about one-half of whom have professional status. This body of highly trained men and women with specialized knowledge in various disciplines are responsible for the scientific publications and patents listed here.

R. J. Dimler, Director

REQUEST FOR INFORMATION

The results of the research of the Northern Division are published regularly in the technical literature, and public-service patents are secured to cover patentable inventions and discoveries (see page 36). As a convenient guide to our publications and patents, a list with abstracts is published semi-annually. The abstracts describe the current research and indicate the progress achieved. Further information on any of the developments, as well as earlier technical papers, may be obtained by writing us.

In conformance with the policy of the Department of Agriculture, Northern Division publications are available to scientists and other specialists, librarians, representatives of the press, and others interested.

Requests for specific reprints should be by num-

ber and addressed to the Northern Division. Those titles marked with an asterisk [*] are not available for distribution.

Most of the publications are in journals that are available in libraries. Photographic copies of most journal articles on research at this Division can be purchased from the National Agricultural Library of the U.S. Department of Agriculture, Washington, D.C. 20250.

No publications will be sent regularly in response to foreign requests unless exchange arrangements have been made with the Director of the National Agricultural Library.

Copies of previous lists of publications and patents are available upon request.

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PUBLICATIONS

[Publications marked (*) are not available for distribution. When requesting reprints, please order by number.]

1759 • **Multiplies Flour Varieties**

E. L. GRIFFIN, JR. and V. PFEIFER

Food Eng. 37 (1): 86-87. January 1965

Fine grinding and air classification "tailor" wheat flours to specific ingredient requirements.

These techniques also help solve milling problems.

1760 • **Effect of Particle Size on the Mutual Flocculation Between Zinc Oxide and Titanium Dioxide**

L. H. PRINCEN and MARILYN DeVENA-PEPLINSKI

J. Colloid Sci. 19 (9): 786-797. December 1964

An attempt has been made to show that mutual flocculation between oppositely charged colloidal particles can be described entirely from particle size considerations without including the concept of equality of opposite charges on the interacting colloids. This attempts seems to be valid since the composition of maximum mutual flocculation is in-

dependent of time and pH, and can be predicted accurately from the composition of least interaction. The mathematical treatment used has the advantage that only the ratios of the particle sizes and densities of the interacting pigment aggregates are required instead of the absolute values.

1761 • **Prolonged Pancreatic Hypertrophy and Reversibility in Rats Fed Raw Soybean Meal**A. N. BOOTH,¹ D. J. ROBBINS,¹ W. E. RIBELIN,¹ F. DeEDS,¹ A. K. SMITH, and J. J. RACKIS(¹West. Util. Res. Develop. Div., Albany, Calif.) Proc. Soc. Exptl. Biol. Med. 116 (4): 1067-1069. August-September 1964

When defatted raw soybean meal was fed to weanling female rats for 192 days, pancreatic hypertrophy, reduced feed efficiency, and decreased body weight gains were observed. Pancreas enlargement was also observed when adult male rats were fed the raw soybean meal-containing diet for

the same period. The pancreatic hypertrophy in rats ingesting raw soybean meal for 38 days was reversed when the rats were switched to the control diet for 154 days. Pancreatic tissues, which had been hypertrophied for more than 6 months, showed no histopathological damage.

1762 • Seed Meal from *Crambe abyssinica*

C. H. VanETTEN, M. E. DAXENBICHLER, J. E. PETERS,
I. A. WOLFF, and A. N. BOOTH¹
(¹West. Util. Res. Develop. Div., Albany, Calif.)
J. Agr. Food Chem. 13 (1): 24-27. January-February 1965

Compositional characteristics of crambe seed meal are reported which are significant to its utilization. The hexane-extracted meal contains 9 to 11% thioglucosides, determined by a sulfate procedure described in detail. These thioglucosides are extractable with acetone or methanol containing 20 to 25% water, which removes one-fifth to one-fourth of the meal solids. Extraction of defatted

meal with aqueous acetone removed much of the toxic or unpalatable material which was present in both the whole and the hexane-extracted seed meal as determined by rat feeding experiments. Nitrogen solubility of the hexane-extracted meal plotted as a function of pH gave two minima at which 40 and 42% of the nitrogen are in solution, only 12% of which was accounted for as nonprotein nitrogen.

1763 • Fonsecin, a Pigment from an *Aspergillus fonsecaeus* Mutant

O. L. GALMARINI and FRANK H. STODOLA
J. Org. Chem. 30 (1): 112-115. January 1965

Fonsecin, a yellow pigment produced by an ultraviolet mutant of the fungus *Aspergillus fonsecaeus*, is shown to be the previously unknown 2-methyl-2,

5,8-trihydroxy-6-methoxy-2,3-dihydro-4H-naphtho
[2,3-b] pyran-4-one.

1764 • Colorimetric Determination of Color of Aerial Mycelium of *Streptomyces*

ALLISTER J. LYONS, JR., and THOMAS G. PRIDHAM
J. Bacteriol. 89 (1): 159-169. January 1965

For some time, streptomycete taxonomists have been seeking to describe more accurately the colors of aerial mycelium. Some of the descriptive systems involve many different color names and groups. Others combine many colors into a few groups. All the systems and methods leave much to be desired. To obtain an accurate description, a colorimeter with a reflectance attachment was used to examine streptomycete aerial mycelium of 37 strains, representing all the major aerial mycelium color groups. Each color was characterized by three values: dominant wavelength in millimicrons, and

purity and brightness in percentages. All colors of aerial mycelium were of low purity (<25%). Almost all the dominant wavelengths were in the yellow to yellow-green bands of the spectrum. Most of the color tabs matched visually with the streptomycete strains had purities of a higher value than those of the cultures. The reflectance instrument seems to allow a more objective description, and its use may help to clarify the color problem with streptomycetes. It is concluded that at present, color descriptions are inadequate and that the significance of color in speciation requires critical examination.

- 1765 • Spectrophotometric Determination of High Molecular Weight Quaternary Ammonium Cations with Picric Acid. Application to Residual Amounts in Polysaccharides
J. H. SLONEKER, J. B. MOOBERRY, P. R. SCHMIDT,
J. E. PITTSLEY, P. R. WATSON, and ALLENE JEANES
Anal. Chem. 37 (2): 243-246. February 1965

Quaternary ammonium compounds serve as precipitants for isolation and purification of acidic polysaccharides. An assay procedure was developed to measure the residual quantities of quaternary ammonium cation remaining in the purified polysaccharide. The procedure is based on precipitation of the quaternary ammonium cations with picric acid after hydrolysis of the polysaccharide. The

picrate salt is separated by extraction and measured spectrophotometrically. The procedure is sensitive to about 8 micrograms of quaternary ammonium cation in 80 milligrams of the microbial polysaccharides and is not affected by the presence of amino acids or amino sugars. The procedure may be adapted also to the determination of certain secondary and tertiary amines.

- 1766 • Formation of 1,2-O-Isopropylidene- α -D-glucofuranose 5,6-Thionocarbonate by Rearrangement-Fragmentation of Bis(1,2-O-isopropylidene-3-O-thiocarbonyl, α -D-glucofuranose) Disulfide
W. M. DOANE, B. S. SHASHA, C. R. RUSSELL, and C. E. RIST
J. Org. Chem. 30(1):162-166. January 1965

Selective hydrolysis of bis(1,2;5,6-di-O-isopropylidene-3-O-thiocarbonyl- α -D-glucofuranose) disulfide (I) removed the 5,6-O-isopropylidene radical and gave bis-(1,2-O-isopropylidene-3-O-thiocarbonyl- α -D-glucofuranose) disulfide (II) as an amorphous product. Dissolution of II in pyridine

gave equimolar amounts of 1,2-O-isopropylidene- α -D-glucofuranose 5,6-thionocarbonate (III), 1,2-O-isopropylidene- α -D-glucofuranose (VIII), carbon disulfide, and free sulfur. The structure of III is proved by its conversion into known compounds and by its independent synthesis.

- 1767 • Selective Alcoholysis Products of Methyl 9,9-Dimethoxynonanoate
E. H. PRYDE, D. J. MOORE, H. M. TEETER, and J. C. COWAN
J. Chem. Eng. Data 10 (1): 62-64. January 1965

Various ester-acetal derivatives of azelaaldehydic acid were prepared by selective alcoholysis of methyl 9,9-dimethoxynonanoate, an intermediate derived from the ozonization of soybean oil methyl esters. Transacetalization occurred predominantly when alcoholysis was carried out at 75° to 100° C.

for 2 to 4 hours in the presence of potassium acid sulfate as catalyst. Transesterification occurred exclusively when alcoholysis was done at about 100° up to 10 hours in the presence of sodium methoxide as catalyst.

- 1768 • Physical Properties and Chemical Structure of High-Amylose Corn Starch Fractions**
EDNA M. MONTGOMERY, K. R. SEXSON, R. J. DIMLER, and F. R. SENTI
Die Stärke 16 (11): 345-351. November 1964

Amylose and amylopectin of ordinary corn and amylo maize starches isolated from corn after a neutral chemical steep were characterized in terms of intrinsic viscosity, iodine affinity, and beta-amylase convertibility. Purity of amylopectin fractions was demonstrated by paper and thin-layer

chromatography, tests for complex formation, and ultracentrifugal analysis. Conclusive evidence is presented that amylopectin from amylo maize starch differs structurally from that of ordinary corn starch in having increased length of external chains (extending beyond the branch points).

- 1769 • Color and Streptomycetes.**
Report of an International Workshop on Determination of Color of Streptomycetes
THOMAS G. PRIDHAM
Appl. Microbiol. 13 (1): 43-61. January 1965

Results from this workshop suggest that the color systems which seem most practically appealing and effective to specialists on actinomycetes are those embracing a limited number of color names and groups. The broad groupings allow placement of isolates into reasonably well-defined categories based on color of aerial mycelium. Attempts to expand such systems (more color groups) lead to difficulties. It is common knowledge that many of the individual groups in these broad systems, if not all, would contain strains that differ in many other respects; e.g., spore-wall ornamentation, color of vegetative (substratal) mycelium, morphology of chains of spores, and numerous physiological criteria. Also, cultures of intermediate color can be found, which makes placement difficult.

As it now stands, color as a criterion for characterization of streptomycetes and streptovorticillia is in questionable status. Although much useful color information can be obtained by an individual, the application of this information to that in the literature or its use in communication with other individuals leaves much to be desired. More objective methods of color determination are needed. At present, the most effective method that could be used internationally is the color-wheel system of Tresner and Backus. Furthermore, the significance of color in speciation of these organisms is an open question. Obviously, more critical work on the color problem is needed.

- 1770 • Azelaaldehydic Acid-Glycerol Compounds: Potential Polymer Intermediates**
W. R. MILLER, E. H. PRYDE, and J. C. COWAN
J. Polymer Sci., Part B, 3 (2): 131-133. February 1965

Poly(ester-acetals) have been prepared from isopropylideneglycerol azelaaldehyde dimethyl acetal (obtained either through ozonolysis of monoolein or by alcoholysis of methyl azelaaldehyde dimethyl acetal with isopropylideneglycerol) by hydrolysis-polymerization at an aqueous-organic in-

terface. The polymers have an acid end group which can be neutralized or esterified. The sodium salt of the polymer has surfactant properties. Further polymerization and crosslinking give higher elastomeric polymers.

- 1771 • New Crops. A List of Publications for 1964**
North. Util. Res. Develop. Div.
U. S. Agr. Res. Serv., ARS-71-19-3, 3 pp. February 1965. [Processed]

1772 • Further Taxonomic Studies on Straight to Flexuous Streptomycetes

THOMAS G. PRIDHAM and ALLISTER J. LYONS

J. Bacteriol. 89 (2): 331-342. February 1965

The best way to handle streptomycete classification, nomenclature, and identification is through application of a genus-species-subspecies concept. To establish a species, principal criteria are morphology of chains of spores and nature of spore-wall surfaces. Subspecies can be differentiated one from another by other criteria, such as chromogenicity, colors of sporulating aerial mycelium and of vegetative mycelium, carbon utilization patterns, and assessment of qualitative production of antibiotics and sensitivity and resistance to antibacterial antibiotics.

An intensive study of about 75 holotype and potential neotype strains indicated that such a differentiation is difficult to accomplish with confidence. Only 19 of the strains had straight chains of spores and, at this time, are considered to be members of the species *Streptomyces venezuelae* Ehrlich, et al.; 42 of the strains had flexuous chains of spores and were assigned to the species *Streptomyces griseus* (Krinsky) Waksman et Henrici; whereas 6 of the strains had unusual spore-chain morphology. Classic taxonomic procedures allowed the separation of all the strains into a number of categories.

1773 • Mustard Seed Processing:

Improved Methods for Isolating the Pungent Factor and Controlling Protein Quality

G. C. MUSTAKAS, L. D. KIRK, V. E. SOHNS, and E. L. GRIFFIN, JR.

J. Am. Oil Chemists' Soc. 42 (1): 33-37. January 1965

A modified cooking and extraction process for mustard seed is reported in which the pungent factor, allyl isothiocyanate, is separated from the seed to yield triglyceride oil and protein meal. Although removal of the pungent factor from the oil and meal products was previously reported, investigations were continued to develop critical improvements in the process. A reduction in conversion time, combined with steam stripping and

shorter heating periods, resulted in quantitative recovery of the essential oil and in improved protein quality, as measured by the basic amino acids. Biological testing with rats showed the processed meals to be free of toxic and goitrogenic factors and to be well utilized nutritionally. Preliminary estimates indicate that process costs are nearly the same as for a comparable soybean plant.

1774 • Vinyl Esters of Some Aldehydic Acid Acetals

E. H. PRYDE, D. J. MOORE, and J. C. COWAN

J. Am. Oil Chemists' Soc. 42 (1): 16-19. January 1965

Vinylation of azelaaldehydic and brassylaldehydic acid cyclic acetals from ethylene glycol gave excellent yields of the vinyl esters. Under conditions of the vinyl exchange reaction used, acyclic acetals from monohydric alcohols cleaved to give enol-ethers

as major, inseparable impurities. Radical-initiated polymerization of the pure vinyl esters of the aldehydic-acid cyclic acetals resulted in crosslinking when initiation was by either peroxide or azobis(isobutyronitrile).

1775 • Preparation of Malonaldehyde Acetals by Ozonolysis of Polyunsaturated Fatty Esters

P. FITTON, E. H. PRYDE, and J. C. COWAN

J. Am. Oil Chemists' Soc. 42 (1): 14-16. January 1965

Malonaldehyde acetals were prepared in more than a 70% yield by ozonolysis of the methyl esters of linseed oil, safflower oil, and linoleic acid and by ozonolysis of linseed oil alone. Malonaldehyde tetramethyl acetal could not be separated readily from

caproaldehyde dimethyl acetal by fractional distillation. Conversion of the methyl acetals to propylene glycol acetals, however, resulted in sufficient spread in boiling points for their effective separation by distillation.

1776 • Gas-Chromatographic Determination of Residual Hexane in Hexane-Extracted Soybean Flakes

L. T. BLACK and G. C. MUSTAKAS

J. Am. Oil Chemists' Soc. 42 (1): 62-64. January 1965

A method was developed to determine residual hexane in hexane-extracted soybean flakes by gas-liquid chromatography (GLC). After residual hexane was extracted with pure isooctane, the quantity extracted was determined by GLC. Analyses were run on three different columns. Column efficiency was varied to obtain maximum speed and accuracy. An attenuator was used to amplify the low-signal output of the extracted residual hexane. Accuracy of the method was established by analyzing soybean flakes

containing 0.01 to 7.5% added hexane. The lower limit of accuracy is approximately 0.02%, and the time required for analysis is about 1 hour.

Residual hexane present in other kinds of hexane-extracted oilseed flakes might also be analyzed by this method. It is probable that extraction solvents other than hexane which are infinitely soluble in isooctane can also be determined by the method proposed.

1777 • A Light Test to Measure Stability of Edible Oils

HELEN A. MOSER, C. D. EVANS, J. C. COWAN, and W. F. KWOLEK¹
(¹ARS Biometrical Serv., Peoria, Ill.)

J. Am. Oil Chemists' Soc. 42 (1): 30-33. January 1965

The effect of light on the flavor of edible oils and of various fat-containing foods is reviewed to show its importance in food studies and the need for a method of evaluation. Such a test, in which fluorescent light is used in an easily assembled unit, has been developed, and the parameters for its use have been determined. Identical samples of soybean oil exposed on 10 different days and organoleptically evaluated show the method to be reproducible with a standard deviation of 0.79 in a scoring system of

1 to 10. This method was then applied to soybean, cottonseed, safflower, and hydrogenated-winterized soybean oils, and a light-exposure value was determined for each oil based on a comparison with accelerated storage procedures ordinarily used. Advantages of this light test over current procedures are the short time required for completion, the reduction of variation by a controlled light source, reproducibility of results, and its adaptability to related food products.

**1778 • A New Acid from Calea urticaefolia Seed Oil:
trans-3, cis-9, cis-12-Octadecatrienoic Acid**

M. O. BAGBY, W. O. SIEGL, and I. A. WOLFF

J. Am. Oil Chemists' Soc. 42 (1): 50-53. January 1965

A major constituent fatty acid (31.2%) from Calea urticaefolia (Mill.) DC. seed oil is the previously unknown trans-3, cis-9, cis-12-octadecatrienoic acid. The oil also contains 2.2% of an unidentified acid

and others with gas-liquid chromatographic characteristics that correspond to the conventional fatty acids: myristic, 0.1%; palmitic, 9.3%; stearic, 2.9%; oleic, 5.3%; and linoleic, 48.9%.

1779 • A New Control System for Monitoring Countercurrent Distribution with a Recording Refractometer

R. O. BUTTERFIELD

J. Am. Oil Chemists' Soc. 42 (1): 72. January 1965

A new and simplified system for transporting solvents when monitoring countercurrent distribution with a recording refractometer is described and its operation explained. The new fluoro-resin

and glass pump and its control system is superior to a Toepler pump because of chemical inertness, the elimination of mercury, and improved reliability.

1780 • Partial Reduction of α -Eleostearic Acid with Hydrazine

K. L. MIKOLAJCZAK and M. O. BAGBY

J. Am. Oil Chemists' Soc. 42 (1): 43-45. January 1965

The following products are formed during partial reduction of α -eleostearic acid with hydrazine: cis, trans-9,11-octadecadienoic and trans, trans-11,13-octadecadienoic acids; cis-9-, trans-11-, and trans-13-octadecenoic acids; and stearic acid. The double bonds are reduced individually in the conjugated triene and also in the conjugated dienes that are formed. The reduction is selective, however, since

the trans-11 double bond in the conjugated triene is reduced only slightly to yield the isolated 9,13-diene.

The trans double bond of the cis, trans conjugated diene reduces at a faster rate than the cis bond. No differences were observed in the rate of reduction of the cis-9 and trans-13 bonds in the triene or of the bonds in the trans, trans conjugated diene.

1781 • Festucine, an Alkaloid from Tall Fescue (Festuca arundinacea Schreb.): Chemistry of the Functional Groups

S. G. YATES and H. L. TOOKEY

Australian J. Chem. 18 (1): 53-60. January 1965

The alkaloids of tall fescue hay were separated by paper chromatography into nine components. The most abundant, which comprises about 50% of the total alkaloids, was isolated by preparative paper chromatography. It was crystallized from chloroform as the dihydrochloride salt and recrystallized from absolute alcohol, m.p. 237°-242°C, decomposition. The empirical formula of the free base is $C_8H_{14}N_2O$, and the molecular weight is 154. Chemically, it is similar to loline, an alkaloid from the seed of a related grass Lolium cuneatum. One nitrogen of the fescue alkaloid is tertiary; the other,

secondary. The alkaloid also contains an oxygen function in the form of a cyclic ether. The ether can be cleaved by treatment with HCl at 160°C. for 14 hours to form a hydroxychloro derivative. In this respect, the fescue alkaloid differs from loline--the ether bridge of loline is cleaved under less drastic conditions. Treatment with 25% KOH converts the hydroxychloro derivative to the original fescue alkaloid in low yield. The fescue alkaloid is postulated as a pyrrolizidine nucleus having a methylamino substituent and an oxygen bridge between the two rings.

- 1782 • **Composition of Oilseeds. A List of Publications for 1964**
North. Util. Res. Develop. Div.
U. S. Agr. Res. Serv., ARS-71-23-3, 2 pp. February 1965. [Processed]
- 1783 • **Processing Oilseeds, Oil, and Meal. A List of Publications for 1964**
North. Util. Res. Develop. Div.
U. S. Agr. Res. Serv., ARS-71-24-3, 1 p. February 1965. [Processed]
- 1784 • **Edible Soybean Oil. A List of Publications and Patents for 1964**
North. Util. Res. Develop. Div.
U. S. Agr. Res. Serv., ARS-71-25-3, 5 pp. February 1965. [Processed]
- 1785 • **Edible Soybean Protein Products. A List of Publications for 1964**
North. Util. Res. Develop. Div.
U. S. Agr. Res. Serv., ARS-71-26-3, 2 pp. February 1965. [Processed]
- 1786 • **Chemically Modified Oil Products and Industrial Uses.
A List of Publications and Patents for 1964**
North. Util. Res. Develop. Div.
U. S. Agr. Res. Serv., ARS-71-27-3, 3 pp. February 1965. [Processed]
- 1787 • **Review Articles on Oilseed Crops Research. A List of Publications for 1964**
North. Util. Res. Develop. Div.
U. S. Agr. Res. Serv., ARS-71-29-3, 1 p. February 1965. [Processed]

1788 • Microscopic Characteristics of High - Amylose Corn Starches

M. J. WOLF, H. L. SECKINGER, and R. J. DIMLER

Die Stärke 16 (12): 375-380. December 1964

Endosperm of amylomaize has many cells that contain two types of starch bodies clearly distinguishable from each other in the same cell. One occurs as a mass near the center of the cells, stains reddish with iodine, shows little or no birefringence, and includes filamentous starch bodies. The other is found as the surrounding granules in the same cell, mostly normal in appearance, staining, and optical properties. The number of cells with two types of starch bodies increases with the amylose content of corn.

The average diameter of amylomaize starch granules is distinctly smaller than that of ordinary corn starch; however, variation in granule size is not proportional to the amylose content. In addition to common spherical granules, individual bodies in the starch population of amylomaize include short rods, knobby granules, compound granules, branched or unbranched filaments, and various combinations of these types. The concentration of unusual starch bodies increases as the amylose content of corn increases.

1789 • A New Thioglucoside, (R)-2-Hydroxy-3-butenylglucosinolate from Crambe abyssinica Seed

M. E. DAXENBICHLER, C. H. VanETTEN, and I. A. WOLFF

Biochemistry 4 (2): 318-323. February 1965

The major thioglucosidic constituent of seed from Crambe abyssinica Hochst ex R. E. Fries was isolated and shown to be a salt of (R)-2-hydroxy-3-butenylglucosinolate. This thioglucoside differs only in stereochemical configuration from the glucorapiferin (progoitrin) that occurs in a number of related plants in the mustard family. On enzymatic

hydrolysis the new thioglucoside is converted to the enantiomer of goitrin, a physiologically active degradation product of glucorapiferin. This occurrence in nature, in closely related species, provides an example of substances differing only in configuration at a single asymmetric center.

1790 • Helichrysum Seed Oil. II. Structure and Chemistry of a New Enynolic Acid

R. G. POWELL, C. R. SMITH, JR., C. A. GLASS, and I. A. WOLFF

J. Org. Chem. 30 (2): 610-615. February 1965

Helenynolic acid, a new hydroxy acid isolated from Helichrysum bracteatum seed oil, is shown to have the structure 9-hydroxy-trans-10-octadecen-12-ynoic acid by oxidative degradation, spectral

properties, and lithium aluminum hydride reduction. Although this acid resists acid-catalyzed dehydration, it undergoes etherification in acidic methanol with considerable facility.

1791 • Publications and Patents of the Northern Utilization Research and Development Division, July-December 1964

North. Util. Res. Develop. Div.

U. S. Agr. Res. Serv., unnumb. pub., 28 pp. January 1965

A semiannual list containing abstracts describing results of current research work that appeared as a publication or patent during the specified period.

Similar compilations for previous lists are available upon request.

- 1792 • Extracellular Polysaccharide Produced from Glucose by Arthrobacter viscosus NRRL B-1973: Chemical and Physical Characterization**
 ALLENE JEANES, C. A. KNUTSON, J. E. PITTSLEY, and P. R. WATSON
 J. Appl. Polymer Sci. 9 (2): 627-638. February 1965

The polysaccharide produced in good yields by Arthrobacter viscosus NRRL B-1973 when grown in liquid medium containing glucose was isolated from the culture fluids, purified, and characterized. The constituents of this water-soluble polysaccharide are D-glucose, D-galactose, and D-mannuronic acid (as the potassium salt) in approximately equimolar proportions and with about 25% of *O*-acetyl groups. Properties include, for both native and deacetylated

forms of the polysaccharide: high viscosity of dispersions in water and in solutions containing chlorides, stability of viscosity to shear and to pH change in the normal range, and excellent quality of unsupported films; and for the native polysaccharide: stability in storage and the favorable influence of alcohol-water solvent on rate of dispersion and viscosity attained.

- 1793 • Low Cost Protein Glue for Southern Pine Plywood**
 F. B. WEAKLEY and C. L. MEHLTRETTER
 Forest Prod. J. 15 (1): 8-12. January 1965

A moderately alkaline soybean-blood glue containing a small percentage of dialdehyde starch, a nonvolatile polymeric dialdehyde, has been evaluated in hot-press bonding of southern pine veneers. Procedures for mixing and spreading this glue and for hot pressing the plywood assembly are similar to those used in manufacturing interior Douglas-fir plywood.

Resistance to delamination of southern pine plywood made with the new glue formulation exceeded

present commercial standard requirements for interior plywood. Shear strength of panels was not appreciably affected by changes in relative humidity in the range of 33 to 97% at 77°F. Wet shear strength of the plywood following 48 hours of continuous soaking in cold water was approximately 50% of dry shear strength.

Glue line costs are approximately equal to those for interior protein glues now used in Douglas-fir plywood production.

- 1794 • An Anomalous Low-Molecular-Weight Branched Component in Dent Corn Starch**
 STIG R. ERLANDER, JAMES P. MCGUIRE, and R. J. DIMLER
 Cereal Chem. 42 (2): 175-187. March 1965

In ultracentrifugal schlieren patterns of normal dent corn starch the peak corresponding to amylose comprises 33 or 34% of the total pattern, compared with an amylose content of 26 to 27% as measured by iodine sorption. The discrepancy between absorption and ultracentrifugal analyses is due to an anomalous component that has 4.0% branching, a beta-amylolysis

limit of 56%, and a weight-average molecular weight of 1.4 million. Other studies, such as hydrolysis of amylopectin with proteolytic enzymes or with acid, suggest that the anomalous component of normal dent corn starch is amylopectin not aggregated or complexed with protein.

- 1795 • Molecular Weight of the Gamma-Gliadin Component of Wheat Gluten**
 R. W. JONES, G. E. BABCOCK, and R. J. DIMLER
 Cereal Chem. 42 (2): 210-214. March 1965

The molecular weight of electrophoretically pure gamma-gliadin from Ponca flour was determined in an ultracentrifuge by the sedimentation equilibrium method. In 6 M guanidine hydrochloride plus 0.1 M acetic acid (pH 3.3) both weight average and Z-

average molecular weights are 31,000. In aluminum lactate-lactic acid ($\mu = 0.1$, pH = 3.1) gamma-gliadin is aggregated. Its apparent weight average is 33,000 and Z-average molecular weight, 42,000.

- 1796 • Properties of Dimethyl Sulfoxide-Pretreated Amylomaize Starch**
A. M. MARK, W. B. ROTH, H. F. ZOBEL, and C. L. MEHLTRETTER
Cereal Chem. 42 (2): 209. March 1965

Amylomaize starch pretreated by dispersion in dimethyl sulfoxide (DMSO) and quantitatively precipitated with alcohol has increased water solubility at reasonable temperatures, a property desired in

the preparation of undegraded amylose film. Tensile properties of films prepared from DMSO-pretreated starches compare favorably with those of films prepared from amylose fractionated from corn starch.

- 1797* • Oilseed Research at the Northern Regional Research Laboratory on Dehydrogenation of Fatty Acids**
E. H. PRYDE
Proc. 34th Annual Flax Inst. U. S., Minneapolis, Minnesota, pp. 21-24. November 12-13, 1964

Dehydrogenation is used in much research work, including the formation and aromatization of cyclic compounds, hydrogenation kinetic studies, and biochemical studies on the origin of polyunsaturated fatty acids in higher plants. In these biochemical studies, evidence has been obtained that linoleic and

linolenic acids are formed by consecutive dehydrogenation reactions of oleic acid. Possibly dehydrogenation may prove to be a general pathway to produce polyunsaturated fatty acids from seeds of higher plants.

- 1798* • Progress in Research on Linseed Oil**
E. H. PRYDE and J. C. COWAN
Proc. 34th Annual Flax Inst. U. S., Minneapolis, Minnesota, pp. 29-32. November 12-13, 1964

A documented report concerning a year of progress in the preparation of cyclic fatty acids and the evaluation of cyclic fatty esters as synthetic lubricants; in the chemical modification of linseed

oil products through ozonization; and on the anti-spalling and curing potential for linseed oil to coat concrete.

- 1799 • Quantitative Determination of Double Bond Positions in Unsaturated Fatty Acids After Oxidative Cleavage**
E. P. JONES and V. L. DAVISON
J. Am. Oil Chemists' Soc. 42 (2): 121-126. February 1965

The position and amounts of unsaturation in fatty acids have been determined, especially in pure fractions of partially hydrogenated fats. In developing a quantitative method for determination of ethylenic bonds in monounsaturated and polyunsaturated fatty acids, several procedures were combined. Key features include oxidative cleavage; recovery of cleaved acids as salts; and their conversion to methyl, ethyl, or butyl esters for programmed gas-liquid chromatographic analysis. Monobasic analyses closely agree with the corres-

ponding dibasic analyses, except neither malonic nor propionic acid has been quantitatively estimated. Analyses are shown for cleavage of high-purity oleic, linoleic, and linolenic acids; for cis and trans monoenoates; and for conjugated and nonconjugated dienoates. Demonstrated are the accuracy, precision, and applicability of the procedure to a wide range of pure fractions isolated after both heterogeneous and homogeneous partial catalytic hydrogenation of polyunsaturated fatty acids.

1800 • Clarification of the Identification of Lysenko's Proposed Neotype Strain of *Pseudomonas pseudomallei* (Whitmore) Haynes 1957

W. C. HAYNES

Intern. Bull. Bacteriol. Nomenclature and Taxonomy 15(2): 81-85. April 15, 1965

Lysenko (1961) cited CCEB 472 (NRRL B-12) to identify the strain he proposed as neotype for *Pseudomonas pseudomallei* (Whitmore) Haynes 1957. He thus incorrectly signified that CCEB 472 and NRRL B-12 are different designations of the same strain. In fact, they are strain numbers of two different microorganisms. The correct citation is CCEB 472 (NRRL B-1112). The error has been per-

petuated and compounded in recent catalogues of the Culture Collection of Entomogenous Bacteria, of the Czechoslovak Collections of Microorganisms, and inadvertently of the American Type Culture Collection. Histories of the confounded strains are presented, and the relationships among the accession numbers in various culture collections are shown as aids in untangling the confusion that has developed.

1801 • Homogeneous Catalytic Hydrogenation of Unsaturated Fats: Cobalt Carbonyl

E. N. FRANKEL, E. P. JONES, V. L. DAVISON, E. EMKEN, and

H. J. DUTTON

J. Am. Oil Chemists' Soc. 42 (2): 130-134. February 1965

Homogeneous hydrogenation of unsaturated fats by cobalt carbonyl has been compared with the previously reported catalysis by iron carbonyl. Soybean methyl esters, methyl linoleate, and linolenate have been hydrogenated at 75° to 180° C., 250 to 3,000 p.s.i. H₂ and 0.02 molar concentration of catalyst. The cobalt carbonyl catalyst is more active at lower temperatures than iron carbonyl. The partially reduced products are similar to those observed with iron carbonyl, but the reaction differs in showing much less accumulation of conjugated dienes, no

selectivity toward linolenate, almost complete absence of monoene hydrogenation to saturates, less double bond migration, and more *trans* isomerization. No evidence was found for a stable complex between cobalt carbonyl and unsaturated fats as previously observed with iron carbonyl. The rates of hydrogenation per double bond were the same for linoleate and linolenate on one hand, and for alkali-conjugated linoleate and nonconjugated linoleate on the other.

1802 • Synthesis and Breakdown of the Polyphosphate Fraction and Acid Phosphomonoesterase of *Saccharomyces mellis* and Their Locations in the Cell

RALPH WEIMBERG and WILLIAM L. ORTON

J. Bacteriol. 89 (3): 740-747. March 1965

The conditions for accumulation of polyphosphate in cells of *Saccharomyces mellis* differ in several respects from those for acid phosphomonoesterase biosynthesis and maintenance. Polyphosphate can be synthesized and degraded *in vivo* by resting cells, provided an energy source is present. Experiments with growing cells indicate that the enzyme systems involved in the metabolism of the polyphosphate fraction are constitutive, since cells respond immediately to changes in the level of inorganic phosphate in the external medium. There is no change in the acid phosphatase level in either resting cells or in cells in the lag phase of growth. Enzyme form-

ation or breakdown occurs only in cells that are exponentially dividing. Enzyme is lost rapidly from derepressed cells when they are transferred to a phosphate-rich medium, falling to a low value by the time the cell mass doubles. Protoplasts of repressed cells were prepared to determine the location of ortho- and polyphosphates in the cell. Experimental results do not permit a definite conclusion concerning the location of ortho- and polyphosphates in the cell, other than that they are associated with the protoplast and thus occupy a position different from that of the phosphomonoesterase.

1803 • Physical Properties and Chemical Composition of β -Glucans from Fleshy Fungi
 L. L. WALLEN, R. A. RHODES, and H. RUSSELL SHULKE
 Appl. Microbiol. 13 (2): 272-278. March 1965

Two specimens of higher fungi produced exocellular β -1,3-glucans when their mycelial forms were cultivated under submerged aerobic conditions. Plectania occidentalis NRRL 3137 consumed up to 6% glucose or xylose with about 30% conversion to polymer in a medium composed of hydrolyzed soy protein, salts, and thiamine. A 5% inoculum was used in a 10-day shaken fermentation. After dilution of the culture liquors and partial disruption of mycelia with a blender, solids were removed by centrifugation, and the polymer was precipitated by the admixture of 2 volumes of ethyl alcohol. A sec-

ond polymer was formed in 40 to 65% yield by fermentation with Helotium sp. NRRL 3129, which in the imperfect stage would be identified as Monilia sp. It consumed up to 4% glucose, fructose, mannose, or sucrose in 60 to 72 hours. A 2% inoculum in a medium composed of commercial defatted soy flakes, phosphate, and thiamine in tap water gave a satisfactory fermentation. This polymer was precipitated by the addition of 0.5 volume of ethyl alcohol. Both organisms have a broad pH optimum on the slightly acidic side and did best at about 25°C.

1804 • Fermentative Production of Exocellular Glucans by Fleshy Fungi
 E. N. DAVIS, R. A. RHODES, and H. RUSSELL SHULKE
 Appl. Microbiol. 13 (2): 267-271. March 1965

Two polymers were produced by aerobic fermentation with mycelial forms of fleshy fungi. Both organisms require only simple media containing soybean proteins, salts, and specific sugars. Plectania occidentalis NRRL 3137 requires 10 days for 30%

conversion of glucose to glucan; Helotium sp. NRRL 3129 converts up to 65% sugar in 60 hours. The Helotium polymer is recovered by the addition of one-half volume alcohol.

1805 • Vitamin A Activity of Fermentation β -Carotene for Swine
 D. E. ULLREY,¹ E. R. MILLER,¹ R. D. STRUTHERS,¹
 R. E. PETERSON, J. A. HOEFER,¹ and H. H. HALL
 (¹Michigan State University, East Lansing)
 J. Nutrition 85 (4): 375-385. April 1965

Two experiments were conducted with 171 weanling pigs to provide an estimate of the biopotency of fermentation carotenoids produced by Blakeslea trispora, and to estimate the vitamin A and β -carotene requirement of the depleted 50-kg. pig. Vitamin A depletion for 7 weeks lowered serum vitamin A concentration from 23 to 4 μ g/100 ml. and lowered liver vitamin A concentration from 35 to 2 μ g/gram of dry tissue. Repletion levels of fermentation β -carotene ranged from 0.5 to 3.5 mg./kg. of diet and of all-trans vitamin A₁ palmitate from 250 to 2,000 IU/kg. of diet. By using total liver vitamin A after 9 weeks of repletion as the criterion, one mole of fermentation β -carotene had 11.5% of the biopotency of one mole of all-trans vitamin A₁ palmitate. The minimal requirements for gains from 50 to 100 kg. body weight did not

exceed 0.5 mg. of fermentation β -carotene or 250 IU of vitamin A palmitate/kg. of diet. However, 3.5 mg. of fermentation β -carotene or 1,000 IU of vitamin A palmitate/kg. diet was required to restore serum vitamin A concentration to predepletion levels. Liver vitamin A concentration or total liver vitamin A increased linearly with increasing dietary increments of either fermentation β -carotene or vitamin A palmitate. This relationship was represented by the equation $Y = -0.636 + 0.002 X$ for fermentation β -carotene and by $Y = -4.87 + 0.0174 X$ for all-trans vitamin A₁ palmitate, where Y = milligrams of total liver vitamin A after 9 weeks repletion and X = international units of fermentation β -carotene or of vitamin A palmitate per kilogram of diet.

**1806 • Synthetic Polypeptides Containing Side-Chain Amide Groups:
Water-Insoluble Polymers**

LARRY H. KRULL, JOSEPH S. WALL, HENRY ZOBEL, and R. J. DIMLER
Biochemistry 4 (4): 626-633. April 1965

Synthetic high-molecular-weight polymers containing glutamine residues were employed as model systems for studies of the contribution of side-chain amide to protein properties. Prolamine and glutelin proteins have unique properties that have been related to their high content of glutamine residues. The amide-rich polypeptides were prepared by reaction of poly- γ -methyl- γ -ethyl- or γ -benzyl-L-glutamate with liquid ammonia. Changes occurred

in solubility and optical rotatory dispersion in organic solvents and in X-ray diffraction patterns and infrared spectra of the solid polypeptides as amides replaced ester groups. These observations indicate that side-chain amide groups may associate with peptide amides or side-chain amides in the same or other molecules through hydrogen bonding to effect solubility and conformation of the protein.

**1807 • Air Classification of Leading Varieties in U. S.
Wheat Classes by Standardized Fractionation Procedure**

A. J. PEPLINSKI, L. H. BURBRIDGE, and V. F. PFEIFER
Am. Miller 93 (3): 7-9, 17. March 1965

Thirty wheat varieties from six wheat classes (durum, hard red spring, hard red winter, soft red winter, soft white winter and white club) were processed by similar milling and fractionation schemes. Milled wheat flours of 65% extraction were reground and air classified into five-part fractions. Hardness of wheats correlated generally with first break flour, total break flour, patent flour,

particle size, and coarse residue percentage and protein shift from air classification. The amount of coarse residue obtained from air classifying a flour gives a rough guide to the potential of a wheat for fractionation. Average protein shift index for each wheat class was: durum 6%, hard red spring 13%, hard red winter 26%, soft red winter 57%, and soft white winter and white club 62%.

1808 • Omega-Formylalkanoates by Ozonization of Unsaturated Fatty Esters

D. E. ANDERS, E. H. PRYDE, and J. C. COWAN
J. Am. Oil Chemists' Soc. 42 (3): 236-243. March 1965

Ozonization of the methyl esters of 11-eicosenoic, linoleic, erucic, and linolenic acids gave a number of different homologous methyl ω -formylalkanoates. Complete ozonization of the monounsaturated esters formed C₁₁ and C₁₃ compounds with 90% conversion; partial ozonization of the polyunsaturated esters gave C₁₂ and C₁₅ products with maximum conversions at about 75% consumption of fatty ester. Thus,

methyl linoleate gave 52 and 23% conversions to the 9- and 12-carbon products, and methyl linolenate gave 29, 27, and 19% conversions to the 9-, 12-, and 15-carbon products. Yields of aldehyde or acetal esters in distilled products were 70 to 90% in preparative-scale experiments. Kinetic analysis showed that ozone attack was essentially random. Methanol was used as a participating solvent.

1809 • Alkaline Isomerization of Methyl Crepenynate

J. L. MIKOLAJCZAK, M. O. BAGBY, and I. A. WOLFF
J. Am. Oil Chemists' Soc. 42 (3): 243-245. March 1965

Methyl crepenynate (methyl-cis-9-octadecen-12-ynoate) is readily isomerized by potassium hydroxide in ethylene glycol to an 8,10,12-octadecatrienoic acid in good yield. A reaction carried out at 120°C.

for 1 hour in 10% base is sufficient to convert the nonconjugated enyne system completely to conjugated triene systems.

1810 • Search for New Industrial Oils. XII.

Fifty-eight Euphorbiaceae Oils, Including One Rich in Vernolic Acid

R. KLEIMAN, C. R. SMITH, JR., S. G. YATES, and QUENTIN JONES¹

(¹USDA Crops Research Div., Beltsville, Md.)

J. Am. Oil Chemists' Soc. 42 (3): 169-172. March 1965

Seed oil of *Euphorbia lagascae* Spreng. contains 57% of cis-12,13-epoxy-cis-9-octadecenoic (vernolic) acid. The amount of trivernolin in the glycerides of this species indicates random or restricted random distribution of the vernolic acid.

biaceae were analyzed for oil and protein contents and also for fatty acid composition of the oils. Iodine values of the oils ranged from 87 to 221. Among these oils, samples were encountered with as much as 76% linolenic, 77% linoleic, or 84% oleic acid.

Seed from 57 additional species in the Euphor-

1811 • *Helichrysum* Seed Oil. I. Separation and Characterization of Individual Acids

R. G. POWELL, C. R. SMITH, JR., and I. A. WOLFF

J. Am. Oil Chemists' Soc. 42 (3): 165-169. March 1965

Helichrysum bracteatum (family Compositae) seed oil contains a complex array of unusual fatty acids in addition to the usual palmitic, stearic, oleic, and linoleic acids. Its unusual constituents include 9.5% crepenynic acid; 14.0% epoxy acids, mainly coronaric; 4.4% cis,trans-hydroxy conjugated

dienoic acids; and 7.2% of a previously unknown hydroxyacetylenic acid for which the name helenynolic acid is proposed. A method for determining helenynolic acid in the presence of hydroxy-conjugated dienes is described.

1812 • Effect of Unusual Acids on Selected Seed Oil Analyses

I. A. WOLFF and T. K. MIWA

J. Am. Oil Chemists' Soc. 42 (3): 208-215. March 1965

In the course of chemical compositional studies on seed oils from more than 2,600 species of uncultivated plants, a number of new acids were isolated and structurally characterized. Also included were many fatty acids previously identified but not widely distributed or readily available. Oils containing unusual functional groups often gave unexpected responses to analytical procedures customarily used. To exemplify the analytical results, data are presented on behavior of oils containing oxygenated fatty acids, cyclopropene rings, unusual types and positions of unsaturation, differing chain

length, and sundry combinations of these, in the following procedures: Determination of polyunsaturated acids by ultraviolet spectrophotometry; iodine value versus refractive index plot to single out unusual oils; oxirane oxygen by HBr titration; gas-liquid chromatography; infrared, and nuclear magnetic resonance spectroscopy; and lipoxidase assay. Preliminary experimentation on an automatic analytical hydrogenation apparatus indicates good potential, in its application to both usual and unusual oils, for a rapid determination of total unsaturation with acceptable accuracy and precision.

1813* • Cereal Proteins

J. S. WALL

"Symposium on Foods: Proteins and Their Reactions," eds. H. W. Schultz and A. F. Anglemier, the third in a series of symposia on foods held at Oregon State College, Corvallis, September 3-6, 1963, chap. 14, pp. 315-341. Westport, Conn. 1964

Research on cereal protein composition, structure, development, distribution, and behavior are reviewed. Basic differences exist in electrophoretic mobilities, amino acid content, and structure between albumin, globulin, prolamine, and glutelin protein fractions separated on the basis of solubilities. Heterogeneity of saline-soluble albumins and globulins is evidenced by chromatographic and electrophoretic separation. The prolamine fraction

also consists of several components whose solubility in organic solvents is due to amino acid content and molecular conformation. The high molecular weight and insolubility of glutelins are due to extensive disulfide crosslinks between different polypeptide chains. Milling and baking of cereal products are significantly influenced by the unique properties of these proteins, especially those resulting from disulfide bonds.

1814 • Isolation of Bacterial Polysaccharide B-1459 Through Calcium Hydroxide Complex Formation

C. L. MEHLTRETTER

Biotechnol. Bioeng. 7 (1): 171-175. March 1965

A method is described for the isolation of bacterial polysaccharide B-1459 from aqueous dispersion as a calcium hydroxide complex. The polysaccharide is liberated in fibrous form from the complex by means of hydrochloric acid in methanol solution. Overall recovery of the polysaccharide

from aqueous dispersion is 85%. Direct conversion of the insoluble calcium hydroxide complex to aqueous polysaccharide solution appears to be a low-cost procedure for preparing viscous solutions for industrial use.

1815* • The Search for New Industrial Crops. V.

The South African Calenduleae (Compositae) as a Source of New Oil Seeds

ARTHUR S. BARCLAY¹ and F. R. EARLE

(¹USDA Crops Research Div., Beltsville, Md.)

Econ. Botany 19 (1): 33-43. January-March 1965

Preliminary screening of South African Calenduleae has revealed an abundance of raw material from which new oilseed crops could be fashioned. The better agronomic prospects include species with seed oils high in dimorphecolic acid and species

rich in a conjugated trienoic acid. Developmental research should include an intensive program of selection and breeding of the more favorable prospects with either fatty acid.

1816 • A Millennium of Fungi, Food, and Fermentation

C. W. HESSELTINE

Mycologia 57 (2): 149-197. March-April 1965

Procedures are outlined for the pure culture preparation of some fermented but nonalcoholic foods. These include, tempeh, ragi, sufu, shoyu, ang-kak, tea fungus, and miso. The fungi used in the manufacture of fermented foods belong to the

yeasts, Mucorales, *Aspergillus*, *Penicillium*, and *Monascus*, with an almost complete exclusion of all other fungi. Included as a supplement is a list of food fermentations and references to their literature in which fungi are involved.

- 1817 • **Micro Vapor-Phase Hydrogenation Accessory for Gas Chromatographic Analysis of Fatty Acid Esters of Glyceride Oils**
T. L. MOUNTS and H. J. DUTTON
Anal. Chem. 37 (6): 641-644. May 1965

Complex mixtures of polyunsaturated and saturated fatty acids, as they occur in glycerides of natural origin, have been simplified by hydrogenation of double bonds before introducing their esters into a gas chromatographic column. A micro vapor-phase hydrogenation accessory for attachment at the injection port of gas chromatographic equipment has been developed. Its use combines the hydrogenation

and chromatography steps and provides a rapid technique for simplification of complex mixtures of fatty acid esters. Application of this technique to a variety of oils is described, and results are compared with analysis of the products of the same oils obtained from separate batch hydrogenations. This accessory should be useful in industrial, biological, analytical, and chemical research.

- 1818 • **The Genus *Absidia*: Globose-Spored Species**
J. J. ELLIS and C. W. HESSELTINE
Mycologia 57 (2): 222-235. March-April 1965

Three species of *Absidia* having globose sporangiospores are described from culture; namely, *A. glauca*, *A. coerulea*, and a new species, *A. californica*. They were shown to be closely related by a comparison of their characteristics and by inter-

specific mating reactions of certain strains. Three other species, *A. septata*, *A. reflexa*, and *A. scabra*, must still be recognized even though there are no cultures in existence and apparently they were each reported once.

- 1819 • **An Improved Method for the Preparation of Methyl 6-Chloro-6-deoxy- α -D-glucopyranoside**
H. B. Sinclair
J. Org. Chem. 30(4):1283. April 1965

Reaction of methyl α -D-glucopyranoside with sulfur monochloride (S_2Cl_2) followed by separation of the reaction products by column chromatography gave a 30 to 35% yield of purified methyl 6-chloro-

6-deoxy- α -D-glucopyranoside. This procedure involves fewer steps and gives a higher yield than the method previously available.

- 1820* • **The Search for New Industrial Crops. IV. Prospectus of *Limnanthes***
HOWARD SCOTT GENTRY¹ and R. W. MILLER
(¹USDA Crops Research Div., Beltsville, Md.)
Econ. Botany 19 (1): 25-32. January-March 1965

After a season of observation on *Limnanthes* from flowering to seeding (mid-April through June), nothing was found to discourage economic interest in this group of plants. The genus requires a cool, moist growing season and maturation during late spring. Its annual nature is suitable for cash crop manipulation. The wide dissemination of *L. douglasii* in gardens indicates adaptability to culture. Its short

life cycle and genetic pliability should enable plant breeders to develop rapidly selections giving high oil yields and suitable to a wide range of soils. Intersectional crossing has already been demonstrated. Total seed yield in wild stands was generally good. The chemical structure of the oil indicates a large potential use in several industrial markets.

1821 • Production of Industrial - Grade Polysaccharide B - 1459

P. ROGOVIN, W. ALBRECHT, and V. SOHNS
Biotechnol. Bioeng. 7 (1): 161-169. March 1965

A method to make purified polysaccharide synthesized exocellularly from cereal carbohydrates by the bacterium *Xanthomonas campestris* NRRL B-1459 and a characterization of its properties have been reported previously. Because of increasing commercial interest in a less purified polymer, we have extended our work to include production of a lower cost industrial-grade product. Fermentation of media containing 2.25% corn sugar, seeded with 5% inoculum of B-1459 and cultured aerobically at 82 °F., is complete in 96 hours. The viscous fer-

mented broth contains about 1.5% polymer. A tan product containing approximately 60% polymer and having good viscosity characteristics is obtained by drum drying the fermented broth at steam pressures below 40 p.s.i., 287 °F. Drying at higher temperatures adversely affects viscosity. A good product is also obtained by spray drying. Cost estimates indicate that 5 million pounds per year of dried crude solids could be produced for 37 cents a pound by drum drying or for 41 cents a pound by spray drying.

1822 • New Sources of Water - Soluble Seed Gums

H. L. TOOKEY and QUENTIN JONES¹
(¹USDA Crops Research Div., Beltsville, Md.)
Econ. Botany 19 (2): 165-174. April-June 1965

Seeds from 300 species representing 139 genera in 31 plant families have been surveyed for water-soluble gum (mucilage). Although the Leguminosae, Plantaginaceae, Cruciferae, and Convolvulaceae, are four families that have species whose seeds contain more than 18% gum, the legumes were studied most intensively. Of 163 legume species in 45 genera, 36 had more than 18% gum and 54 between 10 and 18%. Gums analyzed from 20 legumes

for component sugars were all galactomannans. Their specific optical rotation increases regularly as their mannose content decreases. In legume seed, gum often comprises most of the endosperm. These galactomannan gums can be separated by a milling process to provide commercial-grade gums useful for paper additives and for sizing, thickening, or stabilizing agents.

1823 • Chromatography of Soybean Proteins on Hydroxylapatite

W. J. WOLF and DAYLE ANN SLY
Arch. Biochem. Biophys. 110 (1): 47-56. April 1965

Ultracentrifuging resolves water-extractable soybean proteins into four fractions of 2S, 7S, 11S, and 15S. Chromatography on hydroxylapatite with potassium phosphate gradients (0.03-0.5 M) at pH 7.6 yields four major fractions--A, B, C, and D. Fraction A elutes with the starting buffer (0.03 M); the other fractions elute under influence of the gradient. Ultracentrifugal compositions in

decreasing order of relative amounts are Fraction A, 2S; Fraction B, 2S and 7S; Fraction C, 11S, 7S, 15S, and 2S; Fraction D, 7S, 11S, and 15S. Soybean protein fractions also chromatographed included isoelectrically precipitated, globulins, whey proteins, a cold-insoluble fraction, crystalline trypsin inhibitor, and hemagglutinin.

1824 • A C₁₇-Hydroxy-acid from the Oil of Acanthosyris spinescens

R. G. POWELL and C. R. SMITH, JR.

Chem. Ind. (London) (11): 470. March 13, 1965.

Investigation of the seed oil of Acanthosyris spinescens (family Santalaceae) revealed the presence of 9 to 10% of a new C₁₇-hydroxy acid having the structure 7-hydroxy-trans-10,16-heptadecadien-8-ynoic acid. This is the first straight-chain C₁₇

acid discovered in a higher plant in more than small amounts. It also appears to be the first to contain a conjugated enyne together with a terminal methylene grouping.

1825 • Hydrogen Release During Hydrazine Reduction

E. D. BITNER and H. J. DUTTON

Chem. Ind. (London) (11): 650. March 13, 1965

Discovery of hydrogen release during hydrazine reduction is reported, and the influence of this

hydrogen on the stoichiometry of the reaction is described.

1826* • Some Techniques of Radioactive Gas Chromatography for Lipid Research

H. J. DUTTON

"Advances in Tracer Methodology," ed. Seymour Rothchild, vol. 2, pp. 123-134. New York. 1965

Monitoring of gas chromatography for radioactivity by means of ion chambers and scintillation solution is reviewed. Applications to kinetics of

hydrogenation and of enzymatic dehydrogenation are presented.

1827 • Corn Dry-Milling: Effect of Temper Time and Moisture Level on Degerminator Performance

O. L. BREKKE

Cereal Chem. 42 (3): 288-298. May 1965

In pilot-plant tests, yellow dent hybrid corn from a single lot was tempered to moisture levels of 18, 21, and 24% at room temperature and processed in a degerminator of the studded-cone type. Temper time ranged from 0.3 to 8 hours. As temper time increased regardless of the moisture level, degerminator throughput climbed sharply to a maximum in 2 to 3 hours and then fell off; yield of -4+6 grits dropped sharply and then climbed slowly; fat content of these grits climbed and leveled off; and yield

and oil content of -16-mesh fines fell rapidly during the first 3 hours. As the moisture level was increased for temper times beyond 1 hour, degerminator throughput increased; yield of -4+6 grits decreased while the effect on their fat content was indefinite; also effect on yield of -16-mesh fines was indefinite although their fat content decreased. Data were also obtained on degree of hull release and oil recovery.

- 1828 • **Air Classification Response of Durum and Hard Red Spring Wheat Flours**
A. J. PEPLINSKI, A. C. STRINGFELLOW, and E. L. GRIFFIN, JR.
Northwest. Miller 272 (5): 34, 36-37. May 1965

Two durum and four hard red spring (HRS) wheats were separately tempered and milled to flour; with the patent flours of about 68% extraction (wheat basis) blended for fractionation studies. When fractionated by similar fine grinding and air classification methods, all flours yielded fractions con-

taining more than 20% protein, but no flour yielded a fraction with less than 7% protein. Protein shifting values for the HRS flours were from 1-1/2 to 2 times those for the durum flours. Yields of milled products and air-classified fractions and their chemical and physical properties are discussed.

- 1829 • **Mass Spectrometric Studies of Unsaturated Methyl Esters**
W. K. ROHWEDDER, A. F. MABROUK, and E. SELKE
J. Phys. Chem. 69 (5): 1711-1715. May 1965

Mass spectra were determined of methyl and ethyl sorbates, four methyl hexenoate isomers, ethyl 2- and ethyl 3-hexenoate, methyl 2-octenoate, and some of their deuterated derivatives. Ions of mass 59, 74, 87, and $M - 31$ were found in accordance with the expected fragmentation of saturated methyl esters. Both methyl 2-hexenoate and methyl sorbate had characteristic peaks at $M - 15$. The

spectra of deuterium-labeled 2-hexenoate and sorbate and of longer chain esters indicate that the fragment forms by cleavage at the 5-6 carbon-to-carbon bond. Formation of the mass 87 fragment of methyl 2-hexenoate appears to be due to cleavage of the 3-4 carbon-to-carbon bond and rearrangement of two hydrogen atoms rather than to double bond migration followed by cleavage.

- 1830 • **Production of 2-Ketogluconic Acid by Serratia marcescens**
T. J. MISENHEIMER, R. F. ANDERSON, A. A. LAGODA, and D. D. TYLER
Appl. Microbiol. 13(3): 393-396. May 1965

Production of 2-ketogluconic acid from glucose by fermentation with Serratia marcescens NRRL B-486 was studied in 20-liter stainless-steel fermentors. Conditions for 2-ketogluconic acid production included the following: glucose-salt medium, aeration rate of 0.75 volumes per volume per minute, agitation rate of 400 rev./min., temperature of 30° C., CaCO_3 to neutralize the acid formed, and a 5% (v/v) inoculum. Foaming was controlled with an antifoam agent added at intervals during the

fermentation. When 120 grams per liter of glucose were supplied, 95 to 100% yields of 2-ketogluconic acid were obtained in 16 hours. Larger amounts of glucose could be used in the fermentation if the carbohydrate was fed continuously. Continuous feeding of glucose to a total amount of 180 grams per liter gave 95 to 100% yields of 2-ketogluconic acid in 24 hours; feeding glucose to a total amount of 240 grams per liter gave 85 to 90% yields in 32 to 40 hours.

1831 • Identification and Determination of Nonprotein Nitrogenous Substances in Corn Steep Liquor

D. D. CHRISTIANSON, J. F. CAVINS, and J. S. WALL
J. Agr. Food Chem. 13(3): 277-280. May-June 1965

The identity and quantities of nonprotein nitrogenous substances, including amino acids, quaternary nitrogen compounds, and heterocyclic nitrogen compounds, were determined in corn steep liquor because of their nutritional importance in animal feeds and in supplements for fermentation media. After extraction from the liquor with 2% trichloroacetic acid of 80% aqueous ethanol, these substances were separated on columns of cation exchange resins with buffers of increasing pH and quantitatively determined by specific spectrophotometric procedures. Of the total nitrogen in steep

liquor 90% was extractable as nonprotein nitrogen; one-half in free amino acids and ammonia. The four major free amino acids in the liquor are alanine, leucine, proline, and gamma-aminobutyric acid. Choline and trigonelline and the primary quaternary nitrogen compounds. Major purine and pyrimidine derivatives are adenine, xanthine, cytidine, and guanosine. Steep liquor contains a much higher level of free nitrogenous constituents than the corn from which it was derived. Amino acid content varied among three batches of steep liquors from a single manufacturer.

1832 • Quantitative Determination of Monosaccharides by Gas Liquid Chromatography

JAWAHAR S. SAWARDEKER and JAMES H. SLONEKER
Anal. Chem. 37 (7): 945-947. June 1965

Quantitative determination of several monosaccharide mixtures has been achieved with an accuracy of $\pm 1\%$ by the use of gas chromatography. The method is based on conversion of sugars to their trimethylsilyl ether derivatives and their subsequent chromatography on a column 12 feet long and

1/4 inch in diameter, packed with 15% Carbowax 20 M on Chromosorb W (HMDS treated). The method is simple, rapid, and especially suited for the quantitation of mixtures containing glucose, galactose, and mannose.

1833* • Dialdehyde Starches

B. T. HOFREITER

"Wet Strength in Paper and Paperboard," TAPPI Monograph Series
No. 29, ed. J. P. WEIDNER, chap. 5, pp. 50-73. New York. 1965

A comprehensive review of the physical and chemical properties of dialdehyde starch. In this chapter, written specially for a revision of TAPPI Monograph No. 13 on wet-strength paper, the prop-

erties of dialdehyde starch and the techniques for its use in paper applications are described. Commercial derivatives of dialdehyde starch and their properties are also presented.

1834 • Effect of Fertilizer on Air Classification of Wheat Flours

A. C. STRINGFELLOW, V. F. PFEIFER, and E. L. GRIFFIN, JR.
J. Agr. Food Chem. 13 (3): 262-265. May-June 1965

Flours from five varieties of hard red winter wheats, each grown in Oklahoma at seven fertilizer levels, were evaluated for response to fractionation by fine grinding and air classification. In general, the use of nitrogen and phosphorus in unequal proportions produced an increased protein shift when nitrogen predominated and gave a de-

creased protein shift when phosphorus predominated. Response to flour fractionation among the different wheat varieties was, in order: Concho (highest), Triumph, Comanche, Pawnee, and Ponca (lowest). Variations in protein shift owing to wheat variety were greater than those owing to fertilizer level.

1835 • Location of Nonprotein Nitrogenous Substances in Corn Grain

D. D. CHRISTIANSON, J. S. WALL, and J. F. CAVINS

J. Agr. Food Chem. 13 (3): 272-276. May-June 1965

Nonprotein nitrogenous substances in corn contribute to the flavor and nutritional quality of the processed grain in foods and feeds. Because their presence in dry-milled products is determined by their location in the kernel, the amounts of amino acids, quaternary nitrogen compounds, nucleosides, purines, and pyrimidines in germ, endosperm, and bran fractions were measured. Amino acids, which contribute more than 50% of the nonprotein nitrogen

in whole corn or its fractions, are distributed almost equally between the endosperm and the smaller germ fraction, with minor amounts in the bran. The concentration of free amino acids in the germ is several times that in the endosperm. Only small differences exist between the types of amino acids found in germ and endosperm. Quaternary nitrogen and heterocyclic nitrogen compounds were primarily in the germ.

1836 • Utilization of Long Extraction Wheat Flours for Production of Gluten and Starch by the Batter Process

R. A. ANDERSON

Proc. Third Natl. Conf. Wheat Util. Research, held at Manhattan, Kans., November 5-7, 1964, and sponsored by National Association of Wheat Growers; Great Plains Wheat, Inc.; Western and Northern Utilization Research and Development Divisions and other agencies of the U.S. Department of Agriculture; Millers' National Federation, American Baking Institute, and commercial firms; Kansas State University, Agricultural Experiment Station, and Extension Service.

West. Util. Res. Develop. Div.

U.S. Agr. Res. Serv., ARS-74-31, pp. 75-77. April 1965

On the basis of cost analyses, processing results, and gluten quality it was shown that wheat flour at an extraction level of about 85% would be the most satisfactory of a series of six long extraction flours as a raw material for manufacturing gluten, starch, and byproducts. Products essentially equal in quality and yield to those recovered from

commercial second clear flour were obtained. No particular processing problems were encountered either in the preparation of the flour or in the wet-processing operation. The combination procedure described offers another technically and economically feasible approach to the production of wheat gluten and starch from wheat.

1837 • Analysis of Economic Status of Air Classification in the Milling Industry

W. K. TROTTER¹

(¹USDA Econ. Res. Serv., Peoria, Ill.)

Proc. Third Natl. Conf. Wheat Util. Research, held at Manhattan, Kans., November 5-7, 1964, and sponsored by National Association of Wheat Growers; Great Plains Wheat, Inc.; Western and Northern Utilization Research and Development Divisions and other agencies of the U.S. Department of Agriculture; Millers' National Federation, American Baking Institute, and commercial firms; Kansas State University, Agricultural Experiment Station, and Extension Service.

West. Util. Res. Develop. Div.

U.S. Agr. Res. Serv., ARS-74-31, pp. 78-84. April 1965

Analyses of several model situations indicate the use of air classification can be economically profitable to the flour miller, particularly where its use to improve and control flour quality also permits savings in wheat procurement. A gradual

increase in its use may be expected as mills learn to adapt the technique to their requirements. A proper balance between the output of various fractions and demand for these fractions is of utmost importance.

1838 • Progress on Cereal Xanthate for Use in Paper Manufacture

C. R. RUSSELL

Proc. Third Natl. Conf. Wheat Util. Research, held at Manhattan, Kans., November 5-7, 1964, and sponsored by National Association of Wheat Growers; Great Plains Wheat, Inc.; Western and Northern Utilization Research and Development Divisions and other agencies of the U.S. Department of Agriculture; Millers' National Federation, American Baking Institute, and commercial firms; Kansas State University, Agricultural Experiment Station, and Extension Service.

West. Util. Res. Develop. Div.

U.S. Agr. Res. Serv., ARS-74-31, pp. 98-106. April 1965

A considerable body of fundamental information on the structure and properties of starch xanthates has been developed which has been, and will continue to be, useful in guiding our research. The method for continuous xanthation has been scaled up to provide data for firm cost estimates and materials for use in semicommercial trials. Methods have been developed for determining the effect of application variables on xanthide distribution in

paper and in turn relating this to paper properties. Improved conditions for continuous production of xanthided papers on an experimental paper machine have been developed. Reassuring information has been obtained on stability of xanthide papers to adverse conditions. Lastly, studies on bran and ground whole wheat have been initiated to provide even cheaper cereal xanthides than the low-cost products already derived from starch.

1839 • Exploring the Structure of Proteins in Wheat Gluten

R. J. DIMLER

Proc. Third Natl. Conf. Wheat Util. Research, held at Manhattan, Kans., November 5-7, 1964, and sponsored by National Association of Wheat Growers; Great Plains Wheat, Inc.; Western and Northern Utilization Research and Development Divisions and other agencies of the U.S. Department of Agriculture; Millers' National Federation, American Baking Institute, and commercial firms; Kansas State University, Agricultural Experiment Station, and Extension Service.

West. Util. Res. Develop. Div.

U.S. Agr. Res. Serv., ARS-74-31, pp. 141-152. April 1965

A review of methods used in separating gluten proteins, determining structural function of disulfide bonds as related to both molecular size and molecular shape, and establishing relationships between the gliadin and glutenin fractions of gluten. Results

from reoxidation studies on reduced glutenin in dilute solution are different from those obtained with reduced gliadin. One component of gliadin has been prepared in quite pure form, and progress is being made on others.

1840 • Low-Cost Protein Glue Is Water Resistant

F. B. WEAKLEY, PATRICIA A. TRAXLER, and C. L. MEHLTRETTER

Plywood Mag. 5 (11): 46-47. May 1965

Outdoor exposure tests show promise for a new protein glue developed at the Northern Division for southern pine plywood. A cost comparison of the

new glue has also been made with a phenolic resin glue.

- 1841 • **Uniformity of Starch Xanthates Prepared by a Rapid, Continuous Process**
W. M. DOANE, C. R. RUSSELL, and C. E. RIST
Die Stärke 17 (3): 77-81. March 1965

Starch xanthates prepared by a rapid, continuous process were examined to determine uniformity of xanthation. The stable *S*-N,N-diethylacetamide derivative of starch xanthates of degree of substitution (D.S.) 0.12 and 0.34 was prepared. Since the derivative from both xanthates was recovered in nearly theoretical yield, essentially all of the starch molecules must be xanthated. Subsequent fractionation of the diethylacetamide products showed no

difference in the D.S. with respect to molecular size.

Quantitative replacement of the xanthate group with a methyl group followed by fractionation of the *O*-methyl starch into the corresponding *O*-methyl amylose and *O*-methyl amylopectin components showed these fractions had been xanthated to the same level.

- 1842 • **Reactions of Methoxy Hydroperoxides Derived from Methyl Oleate. Catalytic Hydrogenation**
E. H. PRYDE, R. A. AWL, and J. C. COWAN
J. Am. Oil Chemists' Soc. 42 (6): 549-553. June 1965

Yield improvements in carbonyl compounds obtained by catalytic hydrogenation of methyl oleate ozonolysis products have been achieved by use of catalyst poisons and by the proper choice of catalyst support. Byproduct dimethyl azelate formation with palladium on charcoal was about 20% in the absence of a poison; 10%, with sodium acetate

present in the support; and 8%, with triethyl amine in solution. Palladium on calcium carbonate-lead acetate gave about 7%; palladium on zinc oxide with pyridine or lead acetate present gave 9%. The literature is reviewed on the catalytic hydrogenation of methoxy hydroperoxides derived from ozonolyses in methanol.

- 1843 • **Almarcetin, a New Antibiotic Complex**
MARILYN J. BACHLER, ODETTE L. SHOTWELL, LLOYD A. LINDENFELSER, GAIL M. SHANNON, and THOMAS G. PRIDHAM
"Antimicrobial Agents and Chemotherapy - 1964," ed. J. C. SYLVESTER, pp. 53-58. Ann Arbor, Mich., 1965. Proc. 4th Interscience Conf. on Antimicrobial Agents and Chemotherapy, Am. Soc. Microbiol., New York, N. Y., October 26-28, 1964

A search for antimicrobial agents effective against plant diseases has led to the discovery of almarcetin, an antibiotic active against gram-negative, gram-positive, and acid-fast bacteria, yeasts, and molds. Almarcetin, obtained from culture filtrates of a streptomycete, was isolated by carbon adsorption followed by elution with 80% acetone. It was purified by chromatography on acidic alumina and on ion-exchange columns. Almarcetin is a

dialyzable, acidic polypeptide with an absorption maximum at 300 mμ in water. Paper chromatography of the most active product reveals two major zones of inhibition on bioautographs. The two active factors are interconvertible, as demonstrated by paper chromatography of the separated factors. Nine amino acids were identified in acid hydrolyzates of each major factor. Countercurrent distribution concentrates the two major factors separately.

1845 • Deuterium Tracer Studies of the Mechanism of Homogeneous Catalytic Hydrogenation of Sorbic Acid With Pentacyanocobaltate II

A. F. MABROUK, E. SELKE, W. K. ROHWEDDER, and H. J. DUTTON
J. Am. Oil Chemists' Soc. 42 (5): 432-434. May 1965

Exchange of deuterium and hydrogen during homogeneous catalytic reduction of sorbic acid with pentacyanocobaltate II has been investigated. Mass spectrometric analysis of the gas phase above the pentacyanocobaltate II shows slow, incomplete exchange during the course of reduction of either catalyst alone or catalyst and substrate.

Mass spectra of methyl hexenoates from the deuterium exchange experiments have been exam-

ined. The fragmentation patterns of the esters reduced in the presence of D₂O were compared with those reduced in H₂O and with authentic 2-, 3-, and 4-hexenoates. Experimental results indicate that either the hydrogen or deuterium that adds to the double bond originates predominantly from the solvent. It appears that the hydrogen atoms on the δ -carbon atoms in both 2- and 3-hexenoates exchange with deuterium during reduction in heavy water solutions.

1846 • Gluten and Starch from Long Extraction Wheat Flours

R. A. ANDERSON, A. J. PEPLINSKI, and V. F. PFEIFER
Cereal Sci. Today 10 (4): 106-108, 110, 198. April 1965

Long-extraction wheat flours, as high as 95%, were used as raw material for the recovery of starch and vital gluten by the batter process. On the basis of cost analyses, processing results, and gluten quality, wheat flour at an extraction level of about 85% would be the most satisfactory of these

flours as a starting material. Products were obtained essentially equal in quality and yield to those recovered from commercial second clear flour. No particular processing problems were encountered either in the preparation of the flour or in the wet-processing operations.

1847 • Hydrogenated Winterized Soybean Oil. A New Soybean Oil for Export

J. C. COWAN
Soybean Dig. 25 (8): 16-17. May 1965

Improved oils for salad and cooking use can be prepared by a combination of hydrogenation and winterization. Such oils have good flavor and oxidative stability. They represent a commercial improvement in edible liquid soybean oil, particu-

larly for consumer use as a salad and cooking oil and for frying of foods. Serious consideration should be given to the export of these oils to foreign countries.

1848 • Coincidence Corrections for Particle Size Determinations with the Coulter Counter

L. H. PRINCEN and W. F. KWOLEK¹
(¹USDA Biometrical Serv., Peoria, Ill.)
Rev. Sci. Instr. 36 (5): 646-653. May 1965

A new mathematical treatment has been given for coincidence corrections necessary in determining particle size distribution by means of a Coulter counter. The coincidence phenomenon has been divided into "horizontal" and "vertical" interactions, of which the latter is believed to predominate. Expressions are developed relating the observed

count, the real number of particles, the mean diameter, and the standard deviation of a distribution. The resulting equations are rather complex, and although manual solution is not impossible, an electronic digital computer would decrease the time required.

- 1849 • Strontium-90 in 1964 United States Wheat**
V. F. PFEIFER and R. A. ANDERSON
Radiol. Health Data 6 (5): 265-266. May 1965

A total of 67 samples from the 1964 wheat harvest were procured from 21 different locations in 9 different wheat-producing states. These nine states represented 63.2% of the total 1964 wheat production. Although the sampling is probably inadequate for a precise calculation of the average of strontium-90 content of the 1964 U.S. wheat, the results permit a reasonable estimate to be made. Projecting the values for the individual state aver-

ages (average of locations within a state), weighted by the 1964 production figures to the entire 1964 wheat crop, the average is 144 picocuries per kilogram (dry basis) or 130 picocuries per kilogram (as-is basis). This estimate compares well with the U.S. Atomic Energy Commission's predicted average value of 140 picocuries per kilogram (as-is basis) for 1964 U.S. wheat and confirms its prediction of a substantial reduction below 1963 levels.

- 1850 • A Crystalline Polypeptide from the Seed of Crambe abyssinica**
C. H. VANETTEN, H. C. NIELSEN, and J. E. PETERS
Phytochemistry 4 (3): 467-473. May 1965

A polypeptide with prolamine-like solubility was crystallized from an aqueous acetone extract from seed of Crambe abyssinica Hochst ex R. E. Fries. The name "crambin" is proposed for this polypeptide. Electrophoresis and sedimentation show that it is homogeneous and has a molecular weight of 5,000, which agrees with the minimum molecular weight calculated from amino acid composition. Amino acid residues per molecule were threonine, alanine, and aspartic acid, five each; glycine, isoleucine, and proline, four each; cystine, three;

arginine, serine, tyrosine, and valine, two each; and glutamic acid, leucine, and phenylalanine, one each. Three amide nitrogen residues were found. Cysteine, histidine, lysine, methionine, and tryptophan were absent. After performic acid cleavage of the disulfide bonds, crambin remained electrophoretically homogeneous, and its molecular weight did not change significantly. These data indicate that crambin consists of a single peptide chain with intramolecular disulfide crosslinks.

- 1851 • Adsorption Gas Chromatography of Hydrocarbons on Activated Alumina**
R. L. HOFFMANN, G. R. LIST, and C. D. EVANS
Nature 206 (4986): 823-824. May 22, 1965

A multicomponent mixture of saturated and unsaturated hydrocarbons was successfully separated on a single gas-solid chromatographic column of activated alumina. This separation is remarkable when the extreme boiling point range (-88.3 to

+125.8°C.) of the 13-member series is considered and that each was cleanly resolved in less than 30 minutes through the use of temperature programming.

- 1852 • A Search for New Fiber Crops. VIII. Sulfate Pulping of Kenaf (Hibiscus cannabinus)**
T. F. CLARK and I. A. WOLFF
Tappi 48 (6): 381-384. June 1965

Mature kenaf (Hibiscus cannabinus) stalks, chopped but unfractionated, were pulped under several concentrations of chemical by the sulfate process to determine influence of alkalinity and sulfidity on pulp properties. Unbleached and bleached pulps were evaluated.

Within the limits of the study (active alkalinity 15.0, 17.2, and 19.4%; sulfidity 10.0 and 40.0%) pulp yields were unaffected by pulping conditions. Low permanganate values, low bleach consumption, and high bulk were favored by the highest alkalinity and lower sulfidity. The lower sulfidity also reduced

the residual lignin value. Burst factor, breaking length, and folding endurance were also favorably influenced by high alkalinity and low sulfidity. The 15% level of active alkali favored resistance to tear, but sulfidity had no significant effect.

Properties of bleached kenaf pulps were compared to several commercial wood pulps. The kenaf

pulps were superior in strength properties to the hardwoods and also in breaking length and folding endurance to the softwoods. Kenaf and softwood pulps were comparable in bursting strength, but the tearing resistance of kenaf was less.

1853* • Preparation of Dextrans from Growing Leuconostoc Cultures

ALLENE JEANES

"Methods in Carbohydrate Chemistry," vol. V, ed. R. L. WHISTLER, pp. 118-127. New York. 1965

Microbiological and chemical procedures are described in detail for production, isolation, and purification of water-soluble dextrans from Leuconostoc mesenteroides NRRL B-512F and L. dextranicum B-1146 and of water-insoluble dextran from L. mesenteroides B-523. Included are pro-

cedures for maintenance and preservation of the cultures, building up inocula, conducting the fermentation for dextran production, purification, and dehydration of the dextran. Analytical data that serve to characterize the dextrans are given.

1854* • Preparation of a Water-Soluble Dextran by Enzymic Synthesis

ALLENE JEANES

"Methods in Carbohydrate Chemistry," vol. V, ed. R. L. WHISTLER, pp. 127-132. New York. 1965

Procedures are described for producing cell-free culture fluids containing the dextran-synthesizing enzyme, dextranase, from Leuconostoc mesenteroides NRRL B-512F. Also described are procedures for assaying the potency of the enzyme

preparation; for synthesizing the dextran; and for isolating, purifying, and dehydrating the dextran. Chemical and physicochemical data that serve to characterize the dextran are stated.

CONTRACT AND GRANT RESEARCH PUBLICATIONS

[Report of research work done by an outside agency under contract with the U.S. Department of Agriculture and supervised by the Northern Utilization Research and Development Division.]

133-C • The Effect of Varying Centrifugal Field and Interfacial Area on the Ultracentrifugal Stability of Emulsions

ROBERT D. VOLD and ROBERT C. GROOT

University of Southern California, Los Angeles

J. Phys. Chem. 68 (12): 3477-3484. December 1964

- 134-C • On the Dielectric Constant of Starch Solutions**
 ROBERT V. EDWARDS and H. E. HOELSCHER
 The Johns Hopkins University, Baltimore, Maryland
 Die Stärke 16 (10): 321-324. October 1964
- 135-C • Infrared Emission Spectra of Solid Surfaces**
 M. J. D. LOW and H. INOUE
 Rutgers, The State University, New Brunswick, New Jersey
 Anal. Chem. 36 (13): 2397-2399. December 1964
- 136-C • Polymers and Copolymers of Vinyl Pinolate and Some Reactions with Isocyanates**
 R. A. MALZAHN,¹ J. H. GRIFFITH,¹ C. S. MARVEL,¹ GLEN W. HEDRICK,²
 J. B. LEWIS,² CAROLYN R. MOBLEY,² and F. C. MAGNE²
¹ University of Arizona, Tucson; ² Southern Utilization Research and Development
 Division, New Orleans, Louisiana
 J. Polymer Sci., Part A, 2 (12): 5047-5056. December 1964
- 137-C • The Composition of the Oil of Berteroa incana and the Potential Value of its Seed as a Cash Crop for Montana**
 K. J. GOERING, ROBERT ESLICK, and D. L. BRELSFORD
 Montana State College, Bozeman
 Econ. Botany 19 (1): 44-45. January-March 1965
- 138-C • Homopolymerization of Hydronopyl Vinyl Ether and 2-Hydronopoxyethyl Vinyl Ether**
 C. S. MARVEL, R. A. MALZAHN, and J. L. COMP
 University of Arizona, Tucson
 J. Polymer Sci., Part A, 3 (3): 961-969. March 1965
- 139-C • Some Low Molecular Weight Polymers of d-Limonene and Related Terpenes Obtained by Ziegler-Type Catalysts**
 MARIO MODENA, R. B. BATES, and C. S. MARVEL
 University of Arizona, Tucson
 J. Polymer Sci., Part A, 3 (3): 949-960. March 1965
- 140-C • Linseed Oil as a Curing Compound for Concrete**
 CHARLES H. SCHOLER and CECIL H. BEST
 Kansas State University, Manhattan
 Highway Res. News 43 (16): 70-71. December 1964
- 142-C • Sugar Polythioacetals**
 ELIZABETH G. HORVATH, SHARON GARDLUND, SUBODH K. SEN, JAMES W. BERRY, and ARCHIE J. DEUTSCHMAN, JR.
 University of Arizona, Tucson
 J. Polymer Sci., Part A, 3 (5): 1985-1992. May 1965

143-C • Reduction of the Products of Periodate Oxidation of Carbohydrates. XIII. Determination of Sugars in Polysaccharides Oxidized by Periodate

O. P. BAHL, T. L. HULLAR, and F. SMITH

University of Minnesota, St. Paul

J. Org. Chem. 29 (5): 1076-1078. May 1964

[Report of research work supported with funds provided by the U. S. Department of Agriculture under the authority of U. S. Public Law 480, 83rd Congress, and sponsored by the Northern Utilization Research and Development Division.]

68-F • Infrared Spectra of Amylose and Its Oligomers

B. CASU and M. REGGIANI

Scientific Institute of Chemistry and Biochemistry, Milan, Italy

J. Polymer Sci., Part C (7): 171-185. 1964

69-F • Species of Mortierella from India. IV.

B. S. Mehrotra and B. R. Mehrotra

University of Allahabad, Allahabad, India

Zentr. Bakteriolog. Parasitenk., Abt. II, 118 (2): 178-185. July 1964

70-F • Dimargaris verticillata Benjamin var. xerosporica var. nov. and Dimargaris simplex sp. nov. from India

B. S. Mehrotra and Usha Baijal

University of Allahabad, Allahabad, India

Zentr. Bakteriolog. Parasitenk., Abt. II, 118 (2): 171-177. July 1964

71-F* • Species of Mortierella from India. V. Mortierella oligospora Bjorling and M. oligospora var. indica var. nov.

B. S. MEHROTRA, B. R. MEHROTRA, and U. BAIJAL

University of Allahabad, Allahabad, India

Sydowia, Ann. Mycol., Ser. II, 17 (1): 186-189. June 1964

73-F • Polysaccharides of Soy-beans. Part I. Galactomannans from the Hulls

G. O. ASPINALL and J. N. C. WHYTE

University of Edinburgh, Edinburgh, Scotland

J. Chem. Soc. 1964: 5058-5063. December

74-F • Hydroxyl Proton Resonances of Sugars in Dimethylsulphoxide Solution

B. CASU,¹ M. REGGIANI,¹ G. G. GALLO,² and A. VIGEVANI²

¹Scientific Institute of Chemistry and Biochemistry, Milan, Italy

²Lepetit Research Laboratories, Milan, Italy

Tetrahedron Letters (39): 2839-2843. September 1964

- 75-F • **Ricerche sulla Termopolimerizzazione degli Olii Vegetali. Nota IV. Formazione di Acidi Trimeri nella Termopolimerizzazione dell'Olio di Lino** [Research on the Thermopolymerization of Vegetable Oils. IV. Trimer Acid Formation in the Thermopolymerization of Linseed Oil]
E. FEDELI, P. CAPELLA, A. F. VALENTINI, and G. JACINI
Experiment Station for the Fats and Oils Industries, Milan, Italy
Riv. Ital. Sostanze Grasse 41 (12): 647-651. December 1964
- 76-F • **Attività Enzimatiche di Acetobacter suboxydans. Influenza del pH e di Alcuni Substrati sulla Induzione delle Attività 2-e 5-Chetogene e sulla Crescita. Nota II.** [Enzymatic Activities of Acetobacter suboxydans. II. Influence of pH and Certain Substrates on the Induction of 2- and 5-Ketogenic Activity and on Its Growth]
P. SCALAFFA and E. GALANTE
University of Milan, Milan, Italy
Boll. Soc. Ital. Biol. Sper. 40 (23): 1576-1578. December 1964
- 77-F • **Attività Enzimatiche di Acetobacter suboxydans. Influenza del pH sulla Induzione dell'Attività 5-Chetogena** [Enzymatic Activities of Acetobacter suboxydans. Influence of pH on the Induction of 5-Ketogenic Activity]
E. GALANTE and P. SCALAFFA
University of Milan, Milan, Italy
Boll. Soc. Ital. Biol. Sper. 40 (20): 1265-1267. October 1964
- 78-F • **Trace Elements in Edible Fats. VIII. Soybean Oil "Demetalization" with Cation Exchange Resins**
A. VIOQUE, M. A. ALIBI, and MA DEL PILAR VILLAGRAN
Fat and Oil Institute, Seville, Spain
J. Am. Oil Chemists' Soc. 41 (12): 785-787. December 1964
- 79-F • **Three Fast Sampling Techniques for Biokinetic Experiments with Radioisotopes**
JORMA K. MIETTINEN
Biochemical Research Institute, Helsinki, Finland
"Rapid Mixing and Sampling Techniques in Biochemistry," ed. by Britton Chance and others, pp. 303-309. New York. 1964
- 80-F* • **Effects of Quenching Techniques on Results of Fast Sampling Experiments**
TOIVO SAVIOJA
Biochemical Research Institute, Helsinki, Finland
"Rapid Mixing and Sampling Techniques in Biochemistry," ed. by Britton Chance and others, pp. 219-225. New York. 1964

[Report of research work done by an outside agency under a grant from the U.S. Department of Agriculture and supervised by the Northern Utilization Research and Development Division.]

2-G • Conformations of Some Acetylated Aldopyranosyl Halides

D. HORTON and W. N. TURNER

The Ohio State University, Columbus

Chem. Soc. (London), Chem. Commun. (6): 113. March 1965

January – June 1965

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PATENTS

[These patents are assigned to the Secretary of Agriculture. Copies of patents may be purchased (50 cents each) from the Commissioner of Patents, U.S. Patent Office, Washington, D.C. 20231. Order by number, do not send stamps.]

Degraded Starch Polyoxyalkylene Ether Compositions and Process for Producing the Same
FELIX H. OTEY and CHARLES L. MEHLTRETTER
U. S. Patent 3,165,508. January 12, 1965

Yellowing resistant polyurethane foams are obtained by reacting an organic polyisocyanate and a degraded starch glycoside polyoxyalkylene ether containing from about 4 to about 75 mole equivalents of an alkylene oxide. The degraded starch glycoside polyether is prepared by heating an unmodified starch with at least 1 mole equivalent of a polyol at at about 120° to 140°C. for about 30 to 60 minutes

in the presence of a strong mineral acid catalyst, continuing said heating for another 30 to 60 minutes at reduced pressure to completely remove water of reaction and at least partially remove any unreacted polyol, adding a catalytic excess of alkali, and introducing an alkylene oxide while maintaining the temperature at about 130°C. until the desired amount has reacted.

High Solids Protein - Polymeric Dialdehyde Coating Compositions
FRANCIS B. WEAKLEY and CHARLES L. MEHLTRETTER
U. S. Patent 3,169,073. February 9, 1965

Paper-coating compositions comprising 65-70% total solids that impart good wet-rub resistance and high wax pick values but which are sufficiently fluid for as long as 10 hours to permit application by high-speed paper machines are obtained by adding about 200% based on the casein or urea to a

reaction mixture comprising an aqueous borax dispersion of casein, about 2% based on the dry weight of casein of similarly dispersed periodate-oxidized dialdehyde starch containing at least 90% of theory of aldehyde groups, and clay pigment.

Method of Obtaining Detoxified Meal from Seeds Containing Both Isothiocyanate and Thiooxazolidone
GUS C. MUSTAKAS and LARRY D. KIRK
U. S. Patent 3,173,792. March 16, 1965

Crambe abyssinica seeds and rapeseeds which contain two distinct thioglucosides are detoxified to form a blank, nontoxic, high-protein animal feed in a process comprising the steps of dehulling the seeds, tempering the thusly obtained endosperms to a moisture content of about 10%, passing between rolls to form flakes having an average thickness of 0.002-0.005 inch, tempering the flakes to a total moisture content of about 30%, heating at about

50°C. for about 15 minutes to obtain enzymatic hydrolysis of the thioglucosides, heating at about 100°C. for about 30 minutes with both indirect and sparge steam, heating for a few minutes with only indirect steam to lower the moisture content, forming crisps by cooling in air, reducing the frangible crisps by screening, extracting the triglycerides with hexane, and stripping the hexane therefrom.

Polyurethane Foams Using Esterified Dimer Acids

THOMAS E. YEATES and CHARLES M. THIERFELDER

U. S. Patent 3,173,887. March 16, 1965

Polyether urethane foams are prepared by first etherifying commercial dimer acid with 1 to 2 mole equivalents of ethylene oxide and reacting the lowly etherified dimer acid with diisocyanate in the

presence of an amine polymerization catalyst and, optionally, a polyoxyethylated vegetable oil emulsifier.

Anhydrous HCl Modification of Flour

EARL B. LANCASTER and EDWARD L. GRIFFIN, JR.

U. S. Patent 3,175,928. March 30, 1965

Process for modifying flour comprising the steps of adjusting the moisture content of the raw flour to a value of 7.5 to 10.5%, placing the said flour in an enclosed mixing machine, with vigorous mixing introducing 1.3 to 1.6 grams of acid per 100 grams of flour (dry basis) of a member selected from the group consisting of anhydrous HCl gas and anhydrous HCl gas and anhydrous HCl gas diluted with at least about 10 volumes of an inert gas, the said acid members being introduced to the flour at the

respective rates of about 0.019 gram and about 0.067 to 0.17 gram of acid per minute per 100 grams of flour, said flour being maintained at a temperature not exceeding about 45°C., stirring the acid-exposed flour for about 40 to 100 minutes, adding a neutralizing quantity of a member selected from the group consisting of a concentrated aqueous solution of an alkali metal hydroxide and ammonia gas, mixing the acid-modified flour and neutralizing agent for about 60 to 90 minutes.

Coating Compositions Comprising Polymers of Vinyl Ethers of Polyunsaturated Fatty Alcohols

EDWARD J. DUFEK, LYLE E. GAST, HOWARD M. TEETER, GUS C. MUSTAKAS, and JOHN C. COWAN

U. S. Patent 3,179,717. April 20, 1965

Fast drying metal-containing coatings having greatly improved alkali-resistance coupled with hardness and flexibility are prepared by copolymerizing a conjugated polyunsaturated fatty vinyl ether and a cyclic monomer such as cyclopentadiene or the vinyl ether of a cyclic alcohol. Similar

or enhanced inhibition of the tendency of ether linkages to form alkali-vulnerable ester bonds during drying, and especially during baking of the finish, is obtained by graft polymerizing styrene onto the poly-unsaturated fatty vinyl ether homopolymers or copolymers.

Cross-Linked Poly (ester-acetals)

EVERETT H. PRYDE

U. S. Patent 3,183,215. May 11, 1965

Curing of poly(ester-acetal) polymers formed by condensing the pentaerythritol acetal of azelaic semialdehyde with excess ethylene glycol under alkaline conditions is obtained by heating the poly(ester-acetal) polymer with a nonoxidative

catalyst selected from the group consisting of lead oxide, zinc acetate, antimony oxide, litharge, zinc oxide, *p*-toluenesulfonic acid, and boric acid. The crosslinked products are transparent and have an exceptional affinity for glass.

Improved Wet-Strength Paper Comprising Highly Oxidized Periodate Oxystarch and Process of Preparing the Same

JOHN W. SWANSON, EDWARD J. JONES, and CHARLES L. MEHLTRETTER
U. S. Patent 3,184,333. May 18, 1965

A method for imparting greatly improved wet-strength to paper comprises soaking the paper in a 5 to 10% aqueous dispersion of substantially fully periodate-oxidized (dialdehyde) starch that has been

dispersed by heating at up to 95°C. for up to 30 minutes in an aqueous solution containing 1.2 to 3.6% by weight of borax based on the dry weight of the dialdehyde starch.

Protein-Polymeric Dialdehyde Compositions and Process of Coating a Base Therewith

FRANCIS B. WEAKLEY and CHARLES L. MEHLTRETTER
U. S. Patent 3,188,223. June 8, 1965

Insoluble copolymeric coatings for paper, leather, and textiles are prepared by reacting at pH 6 to 7.5 a solution containing borax or other alkali-

dispersed casein or vegetable protein with a solution containing about 10 to 20% (based on the protein) of borax or other alkali-dispersed dialdehyde starch.

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